DRBC Water Quality Assessment Report Evaluation

Every two years, the DRBC compiles a Delaware River and Bay Water Quality Assessment Report for the U.S. EPA, which provides an assessment of the Delaware River and Bay's support of various uses during previous years. The assessment primarily involves comparing levels of key water quality indicators with DRBC stream quality objectives, identifying impaired waters, or those that do not meet DRBC's water quality regulations. The regulations define "zones" in the Delaware River to which the stream quality objectives are applied, and the report assesses water quality based in part upon those zones. The biennial reporting of water quality assessments of the Delaware River and Bay is intended to provide the U.S. EPA, our basin states, and the public with an overview of water quality conditions and to provide a basis for further study.

DRBC's current methodology states that an assessment unit fails to meet its designated use if two data observations fail to meet criteria (one observation plus one confirmatory observation). For example, if we are assessing a large continuous pH dataset with hundreds of thousands of readings and two of those readings are below criteria, the assessment unit fails to meet its aquatic life use designation for pH. With the ever-increasing availability of long-term continuous datasets, we believe this current methodology is excessively stringent when analyzing such datasets. In fact, this stringency makes it difficult to identify areas for water quality improvements. If a large portion of assessments are failing to support aquatic life use, where do we begin to make improvements?

Table 1 shows a summary of assessment results from our 2018 Water Quality Assessment Report for parameters used to assess aquatic life use (note that toxic data and biological data are used in this assessment as well but have separate methodologies that are not being evaluated here). In total there are 48 zone-criteria combinations of which 28 (58.3%) failed to meet aquatic life use given the current DRBC methodology. Every zone had at least one parameter failing to meet criteria, with most zones having at least three parameters failing to meet. We feel that this is a poor representation of the Delaware River and that a change to the methodology could help us not only better represent the river, but also better focus future water quality improvement efforts.

*Table [SEQ Table * ARABIC]. Summary of 2018 DRBC Aquatic Life Use Assessment results. Red indicates zone-parameter combinations that did not meet criteria. Green represents zone parameter combinations that did meet criteria. Black represent zone-parameter combinations that do not have criteria or do not have criteria are not applicable to the available to data.*

Zone	DO	pH	Turbidity	Temp	TDS	Alkalinity
1A						
1B						
1C						
1D						
1E						
2						
3						
4						
5						
6						

In order to examine alternative methods for assessing aquatic life use attainment, we compared methods used by some of our basin states to our current "1+1" methodology. Pennsylvania has a 99% rule in which >99% of observations must meet criteria for an assessment unit meet its designated use. New Jersey has a similar rule to the "1+1" methodology however each exceedance must last for at least 1 hour in order to register as a violation. It should be noted that this methodology can only be applied to long-term continuous datasets (not spot measurements).

Below, we compared the current DRBC "1+1" methodology to the Pennsylvania 99% methodology and the New Jersey "1+1, 1 hour" methodology using data from the 2018 water quality assessment report (date range 10//2012 – 9/30/2017). We analyzed parameters that are used in aquatic life use designations (dissolved oxygen, pH, turbidity, temperature, total dissolved solids and alkalinity). In instances in which long term continuous datasets were available, we applied both the 99% rule and "1+1, 1 hour" rule. For instances in which only spot measurements were available we applied only the 99% rule.

99% Rule

Analysis of DRBC's 2018 Water Quality Assessment dataset using a 99% rule (Table 2) resulted in an increase in the number of assessment unit-parameter combinations meeting criteria from 20 (41.7%) to 31 (64.5%). Zone 5 would meet aquatic life use criteria using this methodology and several zones would be within one or two parameters of meeting aquatic life use.

*Table [SEQ Table * ARABIC]. Analysis of 2018 DRBC Aquatic Life Use Assessment results using the 99% rule. Red indicates zone-parameter combinations that did not meet criteria. Green represents zone parameter combinations that did meet criteria. Black represent zone-parameter combinations that do not have criteria or do not have criteria are not applicable to the available to data.*

Zone	DO	pH	Turbidity	Temp	TDS	Alkalinity
1A						
1B						
1C						
1D						
1E						
2						
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5						
6						

"1+1, 1 Hour" Rule

Analysis of DRBC's 2018 Water Quality Assessment dataset using a the "1+1, 1 hour" rule (Table 3) resulted in a small increase in the number of assessment unit-parameter combinations meeting criteria from 20 (41.7%) to 21 (43.8%). This assessment methodology represents virtually no change from the

current "1+1" methodology. Future analyses could be performed to alter the length of the time necessary to trigger excursions. A two-hour or four-hour minimum length of excursion could be examined. This raises the question of what length of excursion from criteria is biologically impactful? Given the large number of parameters in the assessment and species in the river it would be difficult to select a single value that represents every circumstance. For the purposes of the analysis, we used the the 1-hour length because we felt it was conservative and would ultimately be protective of aquatic life.

*Table [SEQ Table * ARABIC]. Analysis of 2018 DRBC Aquatic Life Use Assessment results using the "1+1, 1 hour" rule. Red indicates zone-parameter combinations that did not meet criteria. Green represents zone parameter combinations that did meet criteria. Black represent zone-parameter combinations that do not have criteria or do not have criteria are not applicable to the available to data.*

Zone	DO	pH	Turbidity	Temp	TDS	Alkalinity
1A						
1B						
1C						
1D						
1E						
2						
3						
4						
5						
6						

Conclusion

Following this analysis, DRBC would like to adopt a **99% rule** for use in the 2020 water quality assessment report. An assessment unit would meet its designate use for a parameter if >99% of the observations met criteria. With the increase in availability of large, long-term continuous datasets, we feel this methodology is well suited to analyze such datasets. We realize that a change of this nature does reduce the stringency of the assessment methodology however we feel that the 99% methodology is still strong. 99% represent a much stricter threshold than was used in older DRBC Water Quality Assessments (90%, pre-2010). We feel that this change will help our water quality assessment report more accurately describe the conditions in our basin and this increase in accuracy will help us focus water quality improvement efforts on areas of need in the future.